



## Ultrasound Diagnostics and Diagnostics of Focal Liquid Lesions of the Liver

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**Abstract:** The development of modern medical technologies has significantly increased the efficiency of diagnosis and treatment of various diseases. Early verification of pathological changes in organs and tissues became possible even before the appearance of the first symptoms of the disease or its complications. In this regard, the frequency of early detection of focal liquid lesions of the liver, such as cysts and abscesses, has increased, which has led to a relative increase in the number of patients with these diseases.

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### Introduction

The frequency of bacterial liver abscesses in hospitalized patients is 0.5-2.0%, with a clear upward trend. Non-parasitic cystic lesions of the liver account for 11.8% of all patients with focal diseases of this organ (Granov A. M., Anfilova L. V., 1994). The number of complications and mortality in surgical treatment using traditional surgical approaches reach 48.5% and 46%, respectively. The high risk of complications, combined with the difficulties of diagnosis and treatment, determines the relevance of this problem.

Diagnosis of non-parasitic cysts and liver abscesses is based on clinical and laboratory data, as well as the results of special examination methods (ultrasound, computed tomography, scintigraphy, laparoscopy). Ultrasound examination is the most accessible and widespread method, which has a fairly high information content in identifying focal liver lesions 2 cm or more in size.

Currently, open and closed (minimally invasive) methods of surgical treatment are used. Open operations include traditional operations performed from wide accesses: laparo- or thoracolaparotomy - and consisting in the opening, sanitation and drainage of a purulent cavity or resection of the affected lobe of the liver. Among the minimally invasive interventions, percutaneous puncture sanitation and drainage under ultrasound control are the most widely used.

### Materials and methods of research

In the period from 2022 to 2023, we observed 132 patients with liquid focal liver formations. Ultrasound examination revealed liver cysts in 74 patients, among which non-parasitic ones predominated (in 94.6% of cases), and in 58 patients - liver abscesses of various nature. Closed minimally invasive surgical interventions under ultrasound control (percutaneous punctures with aspiration of contents and percutaneous external drainage) were performed in 80 patients (37 men and 43 women) aged 21 to 87 years.

For liver abscesses, 45 patients aged 21 to 85 years were operated on, including 25 (55.6%) men and 20 (44.4%) women. Liver abscesses of cholangiogenic nature were noted in 11 (24.4%) patients, post-traumatic in nature were in 19 (42.2%), septicopyogenic etiology was in 15 (33.4%). Solitary abscesses were found in 30 (66.7%), multiple - in 15 (33.3%) patients. Damage to the right lobe of the liver was observed in 26 (57.8%), left - in 15 (33.3%), both lobes - in 4 (8.9%) patients. The abscess diameter ranged from 3.0 to 17.0 cm.

For non-parasitic liver cysts, ultrasound-guided interventions were performed in 39 patients aged 43 to 87 years, 14 (35.9%) men and 25 (64.1%) women. Damage to the right lobe of the liver was observed in 28 (71.8%), left - in 8 (20.5%), both lobes - in 3 (7.7%) patients. The diameter of the cysts ranged from 3.0 to 21.0 cm.

All diagnostic studies and percutaneous surgical interventions were performed on domestic ultrasound scanners CANSONA N9 (MINDRAY). We used mechanical sector sensors with an operating frequency of 3.5-3.7 MHz and a special removable pierced nozzle. For percutaneous transhepatic puncture sanitation, needles 15-20 cm long with an outer diameter of 1.5 mm are used. Drainage interventions were performed using standard sets of special instruments for drainage of cavity formations. All closed transdermal puncture-drainage interventions under ultrasound guidance were performed only under local anesthesia.

### Research results

Echographic semiotics of liver abscesses, identified in 58 patients, changes in dynamics depending on the stage of development of the pathological process. In the early stages, against the background of clinical signs of increasing intoxication in the liver tissue, areas of increased echogenicity without clear boundaries with blurry contours and altered echostructure, not characteristic of normal liver tissue, can be detected. Only after 5-7 days an irregularly shaped liquid structure with uneven contours and heterogeneous hypoechoic content is formed. In the future, it acquires a more regular rounded shape and becomes more hypoechoic. In the abscess cavity, as a rule, bright echo signals are determined from gas bubbles located along the upper contour of the cavity, or tissue detritus along its lower contour. As the abscess matures, the pyogenic capsule thickens, becomes more homogeneous and hyperechoic.

Cholangiogenic abscesses are often multiple in nature and affect both lobes of the liver (in 7 out of 11 patients, we found more than 2 purulent cavities), relatively small size (no more than 5 cm), thin capsule and homogeneous contents. Post-traumatic abscesses are characterized by an irregular shape, a heterogeneous echostructure (due to the presence of tissue detritus and hepatic tissue sequesters in the cavity), a thicker and hyperechoic capsule. It was possible to establish the exact localization of a liver abscess during primary echography in 82.3% of cases, and to differentiate a purulent cavity from a volumetric formation of a different nature - only in 75.0% of cases.

The echographic picture of non-parasitic liver cysts, which we identified in 70 patients, is quite characteristic in an uncomplicated course and does not cause diagnostic difficulties. It is represented by a single-chamber anechoic or sharply hypoechoic formation of a regular round shape with even

contours and homogeneous contents, and does not have a pronounced wall. In the case of cyst suppuration, its contents become heterogeneous, a suspension of solid particles appears in the form of small bright echo signals. In 4 patients, multi-chamber liquid formations with a diameter of 7 to 15 cm with a pronounced hyperechoic capsule and internal septa were revealed. According to the results of a serological study, parasitic cysts were diagnosed in these cases.

Ultrasound-guided diapaetic interventions for liver abscesses were performed in 45 patients. Two methods of operations were used: percutaneous puncture with simultaneous aspiration of pus and sanitation of the abscess cavity, as well as percutaneous drainage with washing of the purulent cavity. The number of operations per patient averaged 1.8 (79 operations in total).

Percutaneous punctures with aspiration of pus and washing the abscess cavity with an antiseptic solution were performed for thin-walled abscesses with homogeneous contents. According to this technique, 17 patients were treated, who underwent 47 operations (an average of 2.8 per patient). In 15 patients (88.2%) with an abscess cavity diameter of up to 5 cm, a cure was achieved. After each resanation, the size of the purulent cavity progressively decreased, until complete recovery. In 2 patients (11.8%), puncture -aspiration sanitation was ineffective due to the large diameter of the abscess cavity (more than 7 cm) and the rigidity of its wall. These patients were operated on again, they underwent percutaneous drainage under ultrasound guidance. The average bed-day after surgery was 12.2. There were no complications. There was no need for conversion to laparotomy. Lethal outcome was observed in 1 (5.9%) patient 85 years old with purulent cholangitis complicated by sepsis and multiple organ failure.

Percutaneous drainage of liver abscesses was performed in 28 patients with large cavity sizes (more than 7 cm) and the presence of thick viscous pus. In 23 (82.1%) patients, the treatment was successful, the abscess cavities cleared of pus, gradually decreased in size, and a complete cure occurred. In 3 (10.7%) cases with post-traumatic abscesses, drainage was ineffective due to the presence of hepatic tissue sequesters in the cavity, which required surgical treatment by traditional laparotomic access. Complications were noted in 2 (7.2%) patients: in the 1st (3.6%) case - dislocation of the drainage with the development of local purulent peritonitis, in the 2nd (3.6%) - erosive bleeding into the abscess cavity. Both patients were operated on urgently by the traditional method. The average bed-day after surgery was 17.7, there were no deaths. In 12 patients, drainage of liver abscesses was performed according to the two-stage Seldinger technique and in 16 patients, according to a one-stage technique using stylet trocars. With a large size of the purulent cavity (10 cm or more), 2 drainage tubes were installed in 12 patients. For adequate drainage, thermoplastic catheters with a diameter of at least 4 mm were used. In order to sanitize purulent cavities through the lumen of the drains, fractional washing methods were used (at least 4 times a day with a total daily volume of 1–1.2 liters of an antiseptic solution) and washing in a drip-flow mode (an antiseptic solution in a volume of up to 3.5 liters was injected into the lower drain, dialysate flowed passively through the upper one).

Percutaneous punctures with aspiration of cyst contents were performed in 21 (53.8%) patients with cysts 3 to 7 cm in diameter, including 13 of them with simultaneous sclerotherapy. Sclerotherapy in this group was carried out according to a one-stage method: the sclerosing agent was injected into the residual cavity of the cyst after aspiration of its contents through the lumen of the puncture needle and, after exposure for 5 minutes, was aspirated back. 96% ethanol was used as a sclerosing agent. In 1 patient, after the administration of ethanol, short-term pain in the right hypochondrium was noted, which was stopped by the administration of analgesics, and in 2 patients, subfebrile fever on the first day after surgery. In 3 patients who did not undergo sclerotherapy, the disease relapsed during the first year of observation, which required re-intervention with puncture sclerotherapy in 2 cases. The third patient underwent percutaneous external drainage with sclerotherapy 1.5 years after the puncture. There were no complications or deaths in this group.

Treatment of cysts by percutaneous external drainage was performed in 18 (46.2%) patients, including 12 patients with festering cysts. Drainage was performed both with the help of stylet trocars (in 7 cases) and by the Seldinger method (in 11 patients). To ensure adequate sanitation of the festering cyst, drains with a diameter of at least 4 mm were used. In 6 patients, cyst drainage surgery was combined with sclerotherapy. As a sclerosing agent, 70% ethanol was used, which was injected into the residual cavity of the cyst through the drainage lumen for 24 hours, after which the drainage was removed. There were no reactions to the administration of the sclerosant. Complications and lethal outcomes were not observed. No recurrence of cysts was noted in this group of patients.

### Discussion of the results of the study

Difficulties in topical diagnosis and verification of a mass-occurring liver lesion on ultrasound may occur when it is located closer to the diaphragmatic surface of the liver, in segments VII–VIII, which are partially covered by the lower edge of the right lung, which makes it difficult to view this zone. With doubtful results of the examination, a diagnostic puncture with aspiration of the contents or a biopsy under ultrasound guidance is indicated, which, according to indications, can be transformed from a diagnostic intervention into a therapeutic one.

Minimally invasive surgical interventions under ultrasound guidance are currently widely used in the treatment of liver cysts and abscesses. For all their seeming simplicity, they require a serious attitude and should be carried out only in an operating room in compliance with all the requirements of asepsis and antisepsis, with the availability of appropriate equipment and instruments, with sufficient qualifications of the operator and with the possibility of immediate conversion to laparotomy in case of complications. The puncture should be performed through a safe acoustic window, along the shortest trajectory and only with a clear visibility of the pathological focus.

Minimally invasive interventions in the treatment of liver abscesses can be effective only when a full complex of treatment is carried out, including detoxification, antibacterial, infusion, immunomodulatory therapy.

Percutaneous Puncture -aspiration sanitation is indicated for thin-walled abscesses with homogeneous contents, having a diameter of not more than 7 cm. The technique itself involves the performance of repeated operations, since it is possible to achieve full sanitation of the purulent cavity, as a rule, in 2–3 doses. In 88.2% of cases, these operations were successful. In 11.8% of patients, interventions were ineffective due to incorrect definition of indications (large diameter of the abscess cavity and rigidity of the wall), which required percutaneous drainage under ultrasound control. The absence of complications, low mortality rate (5.9%) and a relatively short (12.2) postoperative bed-day allow us to consider the treatment result as good.

Percutaneous drainage is indicated when the abscess cavity is larger than 7 cm, there is thick viscous pus and a dense rigid wall. These operations, by their nature, involve a single performance, but require longer postoperative care. The effectiveness of treatment depends on the adequacy of drainage (the use of drains with a diameter of at least 4 mm, 2 drains in a large-diameter cavity) and the completeness of the sanitation of purulent cavities (washing should be carried out both by fractional and drip-flow methods). Drainage can be stopped only in the complete absence of purulent discharge, normalization of clinical and laboratory parameters and elimination of the purulent cavity according to ultrasound monitoring. In 80.8% of patients after drainage of liver abscesses, a complete cure occurred. In 11.5% of cases, operations were ineffective due to incorrect definition of indications for them. The presence of hepatic tissue sequesters in the cavity of post-traumatic abscesses required surgical treatment by the traditional laparotomy method. Complications were noted in 7.6% of patients, and in 1 case the complication (drainage dislocation with the development of local purulent peritonitis) was purely



technical. The average bed-day after surgery was 17.7, there were no deaths. In this group of patients, the results of treatment should be considered quite satisfactory.

Ultrasound-guided interventions for non-parasitic liver cysts were performed in 39 out of 70 patients, which accounted for 55.7%. Puncture- draining operations are not indicated for patients with parasitic cysts ; such patients should be operated on only by traditional methods.

Percutaneous punctures with aspiration of the cyst content were performed in 53.8% of cases. They are indicated for uncomplicated cysts with a diameter of 3 to 7 cm. After a simple puncture of a liver cyst under ultrasound control, there is a high probability of its recurrence, which we encountered in 3 cases in patients who did not undergo sclerotherapy, which required repeated intervention under ultrasound control with sclerotherapy. Sclerotherapy with 96% ethanol in this group was carried out according to a one-stage method. There were no complications, deaths, or conversions to laparotomy.

Percutaneous external drainage was performed in 46.2% of cases, mainly for festering cysts (32.4%). Drainage was performed using both stylet trocars and the Seldinger method . Ensuring adequate sanitation of the purulent cavity requires the use of thicker drains, which should be removed only after complete cleansing and elimination of the cavity. In 16.2% of patients, cyst drainage surgery was combined with sclerotherapy with 70% ethanol according to the extended technique. In this group of patients, there were no recurrences of cysts, complications, and lethal outcomes; there were no conversions to laparotomy.

It should be noted that percutaneous Sclerotherapy of liver cysts is categorically contraindicated in cases where the cyst communicates with the bile ducts or the abdominal cavity.

The results of our study suggest that ultrasound is a simple, affordable and reliable method for diagnosing focal liquid lesions of the liver. Reasonable use of echo-controlled puncture - draining diapedumatic methods for liver abscesses and non-parasitic cysts allows to achieve positive results of treatment with minimal mortality and a low number of complications.

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